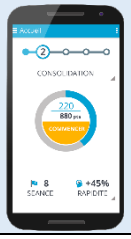
EYEKON E.R.D

Over 30 years of Scientific Research

Eyekon E.R.D is a visual neuroscience technology company, utilizing patented technology to develop and commercialize consumer-oriented software applications for improving, through exercise, vision sharpness and vision performance by improving the image processing function in the visual cortex of the brain. We deliver our scientific products through a game-like experience based on mobile applications ("App"). Our product is currently implemented on the Apple iOS (iPhone, iPod, iPad) and Android platforms.

GlassesOff

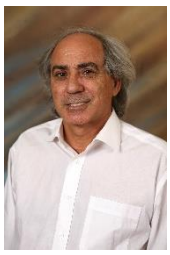
GlassesOff app, focuses on eliminating the dependency on reading glasses of people over the age of 40 who experience the natural and inevitable age-related changes in their near vision sharpness.



COMPANY OVERVIEW

Eyekon E.R.D's innovation is based on **over 30 years of scientific research into the field of perceptual learning**, which has yielded a real breakthrough in visual skills' enhancement by improving image processing speed and efficiency of the brain's visual cortex without altering optical functions of the eyes. There are several renowned achievements in the area of perceptual learning, including solutions for visual conditions such as amblyopia, loss of vision resulting from stroke, and others.

Eyekon E.R.D's scientists have been able to develop a unique method of brain training that **significantly improves vision performance** by boosting the brain's image processing abilities. Several controlled studies conducted with our technology have proven its effectiveness, which is also supported by users' feedback. The results from various studies with our technology were published in leading scientific journals, such as ***Nature's Scientific Reports***, ***PNAS*** and ***Vision Research***.



Prof. Uri Polat, Ph.D, Professor of Clinical and Visual Neuroscience, is Eyekon E.R.D's Co-Founder and Chief Scientific Officer**.**

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SELECTED PEER-REVIEWED SCIENTIFIC PUBLICATIONS

Vision improvement in pilots with presbyopia following perceptual learning Israeli Air Force (IAF) pilots continue flying combat missions after the symptoms of natural near-vision deterioration, termed presbyopia, begin to be noticeable. Because modern pilots rely on the displays of the aircraft control and performance instruments, near visual acuity (VA) is essential in the cockpit. We aimed to apply a method previously shown to improve visual performance of presbyopes, and test whether presbyopic IAF pilots can overcome the limitation imposed by presbyopia. Our results show that despite their initial visual advantage over age-matched peers, training resulted in robust improvements in various basic visual functions, including static and temporal VA, stereoacuity, spatial crowding, contrast sensitivity and contrast discrimination. Moreover, improvements generalized to higher-level tasks, such as sentence reading and aerial photography. *A. Sterkin, Y. Levy, R. Pokroy, M. Lev, Liora Levian, R. Doron, O. Yehezkel, M. Fried, Y. Frenkel-Nir, B. Gordon, U. Polat. (2017). Vision improvement in pilots with presbyopia following perceptual learning. Vision Research.*

Training under spatial and temporal constraints improves crowded and uncrowded visual acuity
This study explored the effects of perceptual training using the GlassesOff's mobile application on naturally decreased crowded visual acuity in uncorrected presbyopia. After training, the crowded acuity reached the level of the uncrowded acuity measured before training, indicating that training enabled overcoming the effects of crowding. More efficient spatial and temporal processing induced by perceptual learning that may be generalized to improve complex visual functions, such as reading and object recognition, is suggested. *Yehezkel, O., Sterkin, A., Lev, M., & Polat, U. (2015). Training on spatiotemporal masking improves crowded and uncrowded visual acuity*.

Crowding is proportional to visual acuity in young and aging eye
The relationships between varying visual acuity and crowding in the fovea was tested using GlassesOff's mobile application in 195 participants, with an age range of 20 to 68 and acuity gradually reduced due to normal ageing. The results show that crowding is proportional to acuity, with this proportionality affected by acuity-age dependency, with a non-linear S-shaped pattern, compatible with both the onset age of presbyopia and a saturation in the oldest age group due to eccentricity effects. The high variance in the crowding in the young group, even before the onset age of presbyopia, suggests crowding conditions with limited presentation times as a highly sensitive measure of VA, predictive of visual performance in complex tasks, such as reading. *Yehezkel, O., Sterkin, A., Lev, M., & Polat, U. (2015). Training on spatiotemporal masking improves crowded and uncrowded visual acuity*.

Training improves visual processing speed and generalizes to untrained functions

GlassesOff's mobile application was used to train foveal vision of young participants in a recent study conducted at Charité – Universitätsmedizin in Berlin and published in Nature's *Scientific Reports.* Several significant improvements in spatio-temporal visual functions were observed, including near and non-trained far distances. A remarkable transfer to visual acuity measured under crowded conditions resulted in reduced processing time of 81 ms, in order to achieve 6/6 acuity. In addition, enhanced processing speed may lead to overcoming foveal crowding and hence enable generalization to other visual functions. *Lev, M., Ludwig, K., Gilaie-Dotan, S., Voss, S., Sterzer, P., Hesselmann, G., & Polat, U. (2014). Training improves visual processing speed and generalizes to untrained functions.*

Training the brain to overcome the effect of aging on the human eye

The effectiveness of the GlassesOff product was examined in a study conducted at the University of California at Berkeley and published in Nature's *Scientific Reports*. This study clearly demonstrated the significant benefit of the GlassesOff training program for reading abilities and eye age. Moreover, cutting-edge optometric equipment allowed the scientists to unequivocally determine that the actual source of the observed benefits is solely in the brain and not in the optics of the eyes. *Polat, U., Schor, C., Tong, JL., Zomet, A., Lev, M., Yehezkel, O., Sterkin, A., Levi, D. (2012) Scientific Reports, 2 (278).*

Uncovering foveal crowding?

Visual crowding impairs object recognition in clutter, setting a fundamental limit on visual perception, but always found only in peripheral vision. Here, for the first time, we show that limiting stimulus availability induces crowding in the fovea. Enabling enough processing time in the fovea, for instance, by processing speed enhancement following perceptual learning, both young and presbyopes overcome this effect, improves visual functions relying on central vision, such as reading and driving. *Lev, M., Yehezkel, O., Polat, U. (2014) Scientific Reports, 4 (4067).*

Improving vision in adult amblyopia by perceptual learning

Perceptual training was applied to an adult visual system with amblyopia. Training yielded significant benefits that transfer to higher visual functions, resulting in a two-fold improvement in contrast sensitivity and in letter-recognition tasks in patients between 9 and 55 years old. This is the first evidence for a remarkable vision improvement following perceptual learning in a condition previously acknowledged as untreatable in adults. *Polat, U., Ma-Naim, T., Belkin, M., & Sagi, D. (2004) Proc Natl Acad Sci U S A, 101(17): 6692-6697.*

Making perceptual learning practical to improve visual functions

Generalization, or transfer, of gains acquired on a trained task to other functions is crucial for both understanding the neural mechanisms and the practical values of the training. This study describes a perceptual learning method applied to amblyopia, myopia and presbyopia. The gains were transferred to visual acuity, processing speed and reaction time. Thus, perceptual learning can become a practical method for improving visual functions in people with impaired or blurred vision. *Polat U. (2009) Vision Res, 49(21) 2566-2573.*

Learning to be fast: gain accuracy with speed

The effectiveness of perceptual learning on contrast detection in young adults was tested using behavioral and neurophysiological (Event-Related Potentials, ERPs) measurements. A remarkable improvement in all behavioral measurements, including sensitivity and reaction time, along with shorter latency and increased amplitude of an ERP marker of neuronal interactions within the visual cortex of the brain. Thus, perceptual learning that strengthens inter-neuronal interaction results in a faster processing speed and higher contrast sensitivity. *Sterkin, A., Yehezkel, O., Polat, U. (2011) Vision Res. (61) 115-124*

Neuroplasticity following perceptual learning for visual improvement

The aim of this review is to show that perceptual learning can be applied for practical purposes to improve visual functions of people with special needs. Prof. Polat predicts that perceptual learning methodology will be modified in the near future into complementary or standalone procedures to aid care providers in treating and improving a variety of visual functions that are not addressed by conventional treatment. *Polat, U. (2009) Expert Rev. Ophthalmol. 4(6) 573-576.*

SELECTED PRESENTATIONS AT SCIENTIFIC MEETINGS

Control placebo study to test the efficacy of the GlassesOff scientific engine and mobile application

A masked, placebo-controlled, 60-day trial in individuals aged 40+ with self-reported reduced near visual acuity (NVA) examined the clinical effects on NVA and visual cortex image processing speed (IPS) of training a minimum 35 sessions with the GlassesOff application on a mobile device. The placebo cohort's NVA improvement was close to zero, (0.006 ±0.055 logMAR, or 1.1%), while the active cohort's NVA improved by 0.234 ±0.091 logMAR (71% improvement, meaning that on average they see letters with a font size which is 29% of the baseline font size, or approximately 1/3 of the size of the baseline font). Post training 27 out of 30 (90%) participants from the active cohort reached the study primary objective of improvement of their initial NVA by at least 0.18 logMAR positive delta (2x better NVA). In contrast, no participant from the placebo cohort reached the secondary objective. *FENS 2016*

The effect of perceptual learning on visual processing functions in professional baseball players

Purpose to determine if perceptual learning can enhance vision performance of professional athletes with already superior visual processing functions, including visual acuity, contrast sensitivity, reaction time and processing speed. Professional baseball players achieved significant improvement in various sport related visual skills, especially in visual processing speed. Participants achieved an improvement in visual acuity, even though they started with an average better than 20/20. The results suggest perceptual training can be used to enhance sport related visual skills of athletes. *ACSM 2016*

Digital self-assessment application for identifying ADHD Symptoms

ADHD is a common neurobehavioral disorder, diagnosed by clinicians using subjective tools, sometimes supported by a computerized test, with many cases remaining undiagnosed through adulthood. There is a need for objective tools for ADHD preliminary self-assessment, prompting seeking professional clinical diagnosis if relevant. Here a short, self-administered tool based on dynamic crowded visual stimulation developed by GlassesOff was used to identify ADHD symptoms in 24 ADHD subjects aged 16-28 years, compared to 18 controls aged 20-30 years. The observed large and significant visual acuity reduction in ADHD subjects compared with controls, equivalent to about 2 ETDRS lines, suggests that this digital tool may be used for objective assessment of ADHD symptoms. *ARVO 2015*

Digital precise remote near visual sharpness evaluation on mobile devices

GlassesOff developed a tool for precise remote evaluation of near visual sharpness in order to accurately and remotely estimate reading abilities. Tested on 73 volunteers on iPhone 4, the application better predicts the functional reading acuity due to the brief stimuli presentation, as opposed to single letter detection used in golden standard reading chart measurements. *ARVO 2013*

Vision improvement in pilots with presbyopia following perceptual learning

Israeli Air Force pilots continue flying combat missions after the onset age of presbyopia. Optical corrections limit their flying capabilities. GlassesOff was applied to improve pilots' near visual acuity (VA). Despite their advantage of 0.26 logMAR ($P = 0.001$) in VA for brief presentations (120 or 60 ms) compared with 152 age-matched controls, pilots improved after training ($P = 0.01$), most of them reaching the level of young controls with no significant difference ($P > 0.05$). Gains were generalized to higher functions, such as reading. Training with GlassesOff was effective for overcoming blurred vision, with real operational benefits. *AAO 2014*

Perceptual training on mobile devices improves near visual functions

The resolution and quality of smart phone screens are much better than those of PC monitors, with an average pixel size several times smaller in Apple's retina display than in PC screens. This enables one to achieve better contrast sensitivity by a factor of 2-3, thus providing more prospect for training near visual functions. *ARVO 2012*

Perceptual training on mobile devices for the aging human eye

Training with GlassesOff on mobile devices is an effective solution for improving near vision sharpness in presbyopia by enhancing image processing in the brain, with better contrast sensitivity compared to PC. *AAO 2012*